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Axisymmetric capillary-gravity waves at the interface of two viscous, immiscible fluids - Initial value problem[1] PALAS KUMAR FARSOIYA, RATUL DASGUPTA, Indian Institute of Technology, Mumbai, Dept. Chemical Engineering, India — When the interface between two radially unbounded, viscous fluids lying vertically in a stable configuration (denser fluid below) at rest, is perturbed, radially propagating capillary-gravity waves are formed which damp out with time. We study this process analytically using a recently developed linearised theory (Farsoiya, Mayya and Dasgupta, J. Fluid Mech., In Press, 2017). For small amplitude initial perturbations, the analytical solution to the initial value problem, represented as a linear superposition of Bessel modes at time $t = 0$, is found to agree very well with results obtained from direct numerical simulations of the Navier-Stokes equations, for a range of initial conditions. Our study extends the earlier work by John W. Miles (J. Fluid Mech., 1968) who studied this initial value problem analytically, taking into account, a single viscous fluid only. Implications of this study for the mechanistic understanding of droplet impact into a deep pool, will be discussed. Some preliminary, qualitative comparison with experiments will also be presented.

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